Total Pages : 32

14 - II

14

Optional Paper

Electronics & Telecommunication Engineering

Paper – II

Time : 3 Hours | Maximum Marks : 200

IMPORTANT NOTES / महत्वपूर्ण निर्देश

(A) Please fill up the OMR Sheet of this Question Answer Booklet properly before answering. Please also see the directions printed on the obverse before filling it.
प्रश्नोत्तर पुस्तिका में प्रश्न हल करने से पूर्व उसके संलग्न ओ.एम.आर. पत्रक को भली प्रकार भर लें । उसे भरने हेतु उसके पृष्ठ भाग पर मुद्रित निर्देशों का अध्ययन कर लें ।

(B) The question paper has been divided into three Parts - **A, B** and **C**. The number of questions to be attempted and their marks are indicated in each part.
प्रश्न–पत्र अ, ब और स तीन भागों में विभाजित है । प्रत्येक भाग में से किये जाने वाले प्रश्नों की संख्या और उनके अंक उस भाग में अंकित किये गये हैं ।

(C) Attempt answers in **English**.
उत्तर अंग्रेजी भाषा में दीजिये ।

(D) Answers to all the questions of each part should be written continuously in the script and should not be mixed with those of other parts. In the event of candidate writing answers to a question in a part different to the one to which the question belongs, the question will not be assessed by the examiner.
उत्तर पुस्तिका में प्रत्येक भाग के समस्त प्रश्नों के उत्तर क्रमवार देने चाहिये तथा एक भाग में दूसरे भाग के उत्तर नहीं मिलाने चाहिये । एक भाग में दूसरे भाग के प्रश्न के उत्तर लिखे जाने पर ऐसे प्रश्न को जाँचा नहीं जा सकता हैं ।

(E) The candidates should not write the answers beyond the limit of words prescribed in parts **A, B** and **C** failing this the marks can be deducted.
अभ्यर्थियों को भाग अ, ब और स में अपने उत्तर निर्धारित शब्दों की सीमा से अधिक नहीं लिखने चाहिये। इसका उल्लंघन करने पर अंक काटे जा सकते हैं ।

(F) **In case the candidate makes any identification mark i.e. Roll No./Name/Telephone No./Mobile No. or any other marking either outside or inside the answer book, it would be treated as resorting to using unfair means. In such a case his candidature shall be rejected for the entire examination by the Commission.**
अभ्यर्थी द्वारा उत्तर पुस्तिका के अंदर अथवा बाहर पहचान चिन्ह यथा – रोल नम्बर / नाम / मोबाईल नम्बर / टेलीफ़ोन नम्बर लिखे जाने या अन्य कोई निशान इत्यादि अंकित किये जाने को अनुचित साधन मान जायेगा। आयोग द्वारा ऐसा पाये जाने पर अभ्यर्थी की सम्पूर्ण परीक्षा में अभ्यर्थिता रद्द कर दी जायेगी ।

BLANK PAGE

PART – A

Marks : 40

Note : Attempt all the **twenty** questions. Each question carries 2 marks. Answer should not exceed 15 words. Full marks 2 will be given if answer is correct and complete. For incomplete or partly correct no marks will be awarded.

1 Collector current I_c in terms of β_{dc}, R_c V_{cc} and V_{BE} is given by following equation and V_{BE} value is as follows for shorted base resistor. Assume collector feedback bias and silicon transistor.

2 A tuned amplifier resonance frequency will be in the following range if L is between 1 to 10 μH and C = 0.01 μF.

3 Ideal OPAMP three characteristics are as follows:

4 A D-latch is used and $\bar{Q}$ is connected to D. The output Q when CLK = 0 and CLK = 1 will be as follows :

5 A completely CMOS based complex circuit will have following characteristics when compared to partly CMOS and partly nMOS circuit.

6 An A/D is connected such that V_{ref}^{+} pin is at 2.048 V and V_{ref}^{-} pin is at 1.024 V. It has 10-bit output. Resolution is given by following equation and it cannot convert analog input below certain voltage. It is given by equation.

7 8-Bit full adder circuit can also function as subtractor if following additions are present.

8 Steady state response is defined as follows:

9 Draw signal flow graph for $x_8 = \int x_7 \, dt$

10 Transfer function of a lag compensator is given by following equation and pole and zero are at S = –a and S = –b and b > a.

11 Five carrier frequencies are sent in FDMA. These are 800.0 MHZ, 801.0 MHZ, 802.0 MHZ, 803.0 MHZ and 804.0 MHZ. A guard band of 20 kHZ is required between each carrier. How much signal frequency band can be used?

12 A signal is $s(t) = A e^{j W_c t}$ The average power is given by following equation and average value is taken between two values of time as follows.

13 Brightness level b (x,y) is a periodic functions with period α and β. It can be represented by a two-dimensional fourier series. The fundamental frequencies will be given by following equation and series is given by the following equation.

14 Model diagram of a microwave heterojunction bipolar transistor is as follows : Use Ge or Ga As or both.

15 An optical fibre has repeater at every 6 km. The delay between two repeaters can be calculated by following equation :

16 Write general expression for the distant electric field of a dipole antenna of length L and L = 2H. Assume distant point is at distance r from the dipole centre, 2 θ is angle of radius vector with respect to Z-axis, the direction of alignment of dipole.

17 An aeroplane is detected by ground radar and is at height vertical 4000 m and distance 10 km (horizontally). What is the delay in detecting the plane?

18 Ten integers are at address 2000H to 2009 H and are in ascending order. How will be convert them in descending order at address 2010H to 2019H using a stack date structure? Stack pointer increments on push and decreases on pop.

19 What is the priority order of Trap, INTR and RST 7.5 in 8085? What is priority order in 8086 for Int n instructions ? n can be 0,1,2....254,255.

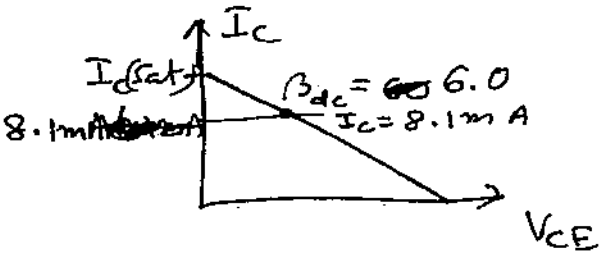
20 Pentium has two pipelines each of 5 stages. If one stage of instruction takes 2 ns, how many instruction/s can execute? What are the situations in which actual number can be less?

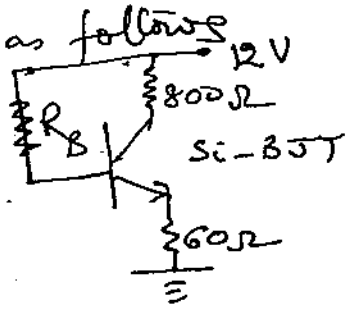
PART – B

Marks : 60

Note : Attempt all the **twelve** questions. Each question carries 5 marks. Answer should not exceed **50** words.

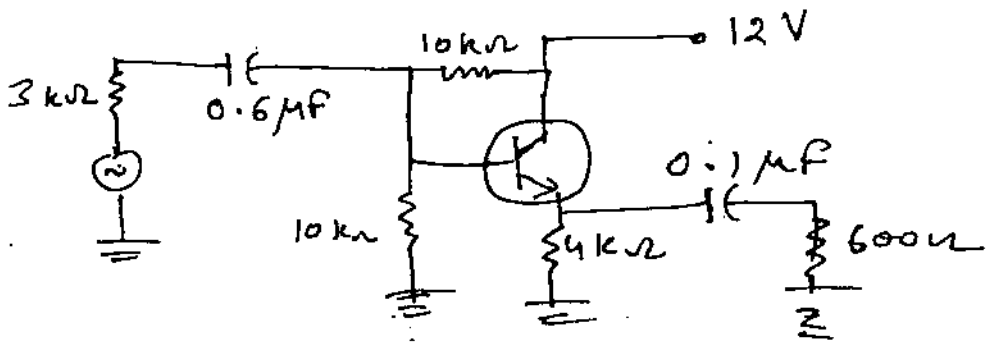
21 I_c is given with respect to V_{CE} as follows :





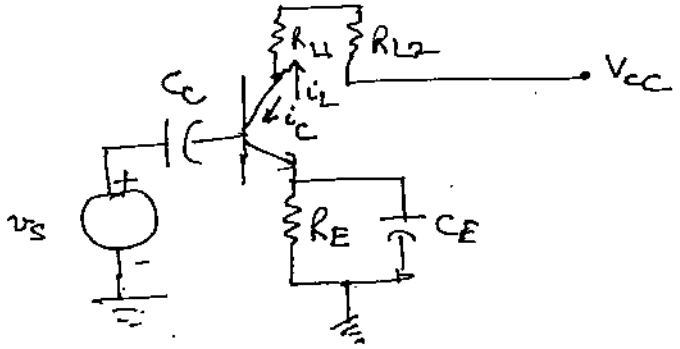
What is R_B? What is I_c (Sat)?

22 Consider a circuit of emitter follower:



Calculate cut off frequencies for input and output lead network if R_{in} = 5 kΩ and R_{out} = 50 Ω.

23 Consider a directly coupled amplifier. How will you calculate average ac power in the load R_{L1}, supplied power, power dissipated by emitter-base network and power dissipated by transistor for the following circuit?



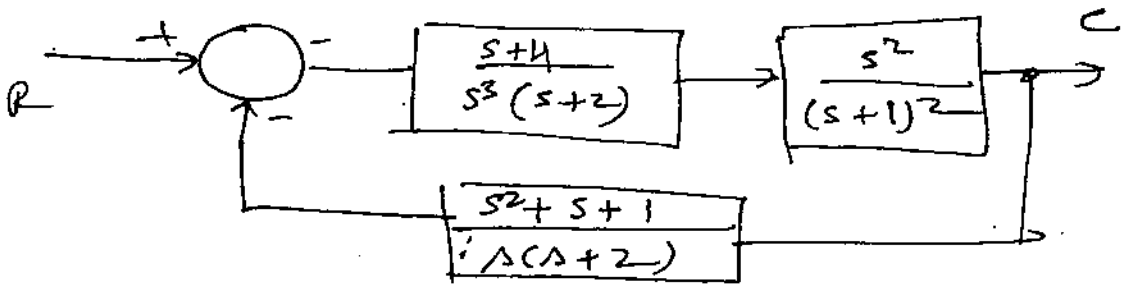
24 Draw truth table and block diagram of a two input multiplexer and a four output decoder.

25 Simply following Karnaugh Map. Take wrapping adjacency also into account.

AB \ CD	$\bar{C}\bar{D}$	$\bar{C}$ D	C D	C $\bar{D}$
$\bar{A}\bar{B}$			1	
$\bar{A}$ B		1	1	
A B		1		
A $\bar{B}$		1	X	

x means do not care.

26 What is the type of following system?

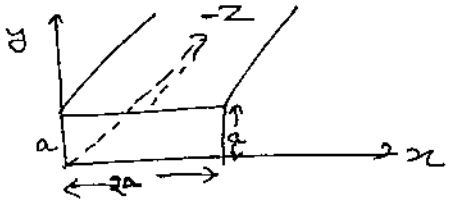


27 Prove that steady state output of a stable system with transfer function P(s) and input where f is frequency, is given by
$Y_{SS} = A\,|P(j\omega)|\sin(2\pi ft + \phi)$
where $\phi = \arg P(j\omega)$.

28 How will you mathematically represent a PAM wave s(t)? Explain each term.

29 A satellite G with geosynchronous earth orbit rotates in an orbit at 42,156 km from earth center and thus has T_{orbit} = 24 hours. How much will be the duration of one orbit for a medium earth orbit satellite Mat 16000 km? Give the numerical expressions, which will be used (need not give final value).

30 Write the expressions which you will use for TE_{10} in rectangular waveguide? The cutoff frequency, group phase velocity and group guided wavelength is to be found out? Velocity of em wave = 3×10^8 m/s.



Assume frequency 3.59 HZ in the waveguide.

31 How will you send the codes for the following text :
Use ASCII codes, *qwse RTY* .

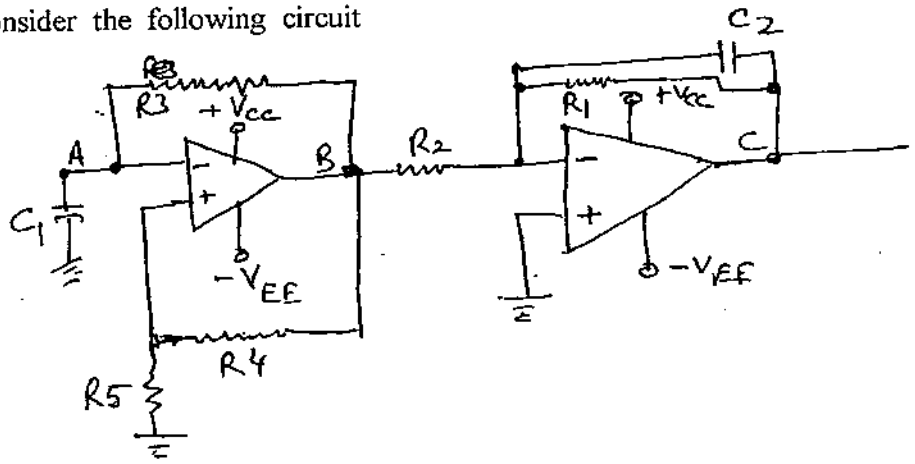
32 Give a microprocess 8085 based circuit showing bus connections to 32 kB ROM and 32 kB RAM.

PART – C

Marks : 100

Note : Attempt any **5** questions. Each question carries **20** marks. Answer should not exceed **200** words.

33 Consider the following circuit



What will be the peak to peak amplitudes at A, B and C? Show the waveforms which will be observed at A, B and C. What will be expression for finding time period of the waves at A, B and C? What is feedback fraction? Justify your answers.

34 Show cell of a static RAM and explain function each component used in the cell and circuit functioning. How many such cells are present in 32 kB memory? How will you modify the static RAM cell to get dynamic RAM cell?

35 Describe root-locus technique to show variation of poles of closed loop system. How will you get closed loop poles from a characteristics equation?

36 Find Fourier Transform of periodic train of unit impulses $\delta_T(t)$

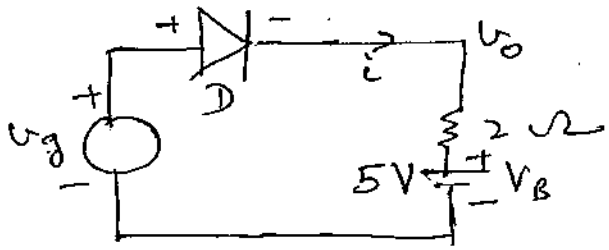
$$\delta_T(t) = \sum_{n=-\infty}^{\infty} \delta(t - nT).$$

Show the impulse trains before and after Fourier transform.

37. Show a focussing of microwave plane wave front collimated rays using a parabolic reflector antenna. Show the geometry, tangent, vertex and parabola axis and curve for the antenna. What is beam width and directivity equation for the antenna.

38 Draw Architecture of 80486.

39 Consider circuit as follows:



v_g = 10 sin wt and V_B = 5 V. Diode when $v_g > V_B$ conducts. Calculate conduction angle γ of diode D out of 360° phase angle changes in v_g. What is average $\sqrt{0}$.

SPACE FOR ROUGH WORK / रफ कार्य के लिए जगह